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Results of the 1990 Survey for Harlequin Ducks (*Histrionicus histrionicus*) on the Kootenai National Forest, Montana and parts of the Lolo National Forest, Montana

A Report to:

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Kootenai National Forest
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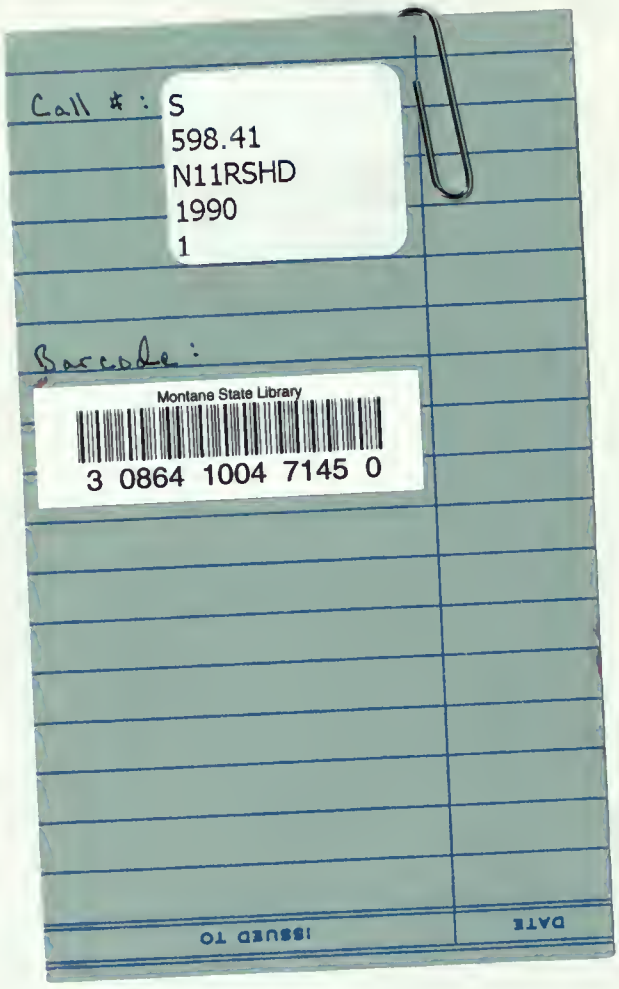
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TABLE OF CONTENTS

Page

TABLES AND FIGURES..... iii

ACKNOWLEDGEMENTS..... iv

SUMMARY..... v

INTRODUCTION..... 1

OVERVIEW..... 2

Description..... 2
Distribution..... 3
Migration..... 4
Breeding Biology..... 5
Habitat Use..... 6

SURVEY AREA..... 7

METHODS..... 8

RESULTS AND DISCUSSION..... 14

Summary of Findings..... 14
Discussion of Creeks Where We Found Harlequins..... 20
Discussion of Potential Harlequin Duck Streams..... 33
Discussion of Results..... 35

RECOMMENDATIONS FOR FUTURE SURVEYS..... 37

CLOSING REMARKS..... 38

LITERATURE CITED..... 40

APPENDICES..... 42

Appendix A. MTNHP Animal Survey Form..... 42
Appendix B. Sighting Poster..... 43

TABLES AND FIGURES

Page

Table 1. Results of Streams Surveyed on the Kootenai and portions of the Lolo National Forests..... 15

Table 2. Harlequin Duck Sightings from the 1990 Surveys..... 19

Table 3. Stream Data for Streams Surveyed in 1990..... 21

Table 4. Historical Sightings of Harlequin Ducks..... 24

Figure 1. Streams Surveyed on the Kootenai National Forest during 1990..... 8

Figure 2. Streams Surveyed on the Lolo National Forest during 1990..... 9

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SUMMARY

This report presents findings of a 1990 field survey for harlequin ducks (Histrionicus histrionicus) in northwest and west-central Montana. A brief overview of the natural history and habitat requirements of harlequin ducks is included.

A total of 45 streams, 37 on the Kootenai National Forest (KNF) and 8 on the Lolo National Forest (LNF), were surveyed between May 5, 1990 and August 31, 1990. Harlequin ducks were observed on 39 occasions. A minimum of 27 individuals were identified. Of the 27 individuals, 6 were males, 7 females and 14 juveniles. The harlequins were located on 7 streams on the KNF: Big Creek, Callahan Creek, Grave Creek, Kootenai River, Marten Creek, Swamp Creek, and the Vermilion River. Harlequins were located on 1 creek on the LNF: Trout Creek. Broods were located on Big Creek, Callahan Creek, Marten Creek and two on Vermilion River, for a total of 5 broods. The sightings on Callahan and Big Creeks are the first confirmed sightings of breeding harlequins on those streams. Brood size of the 5 broods ranged from 1 to 3 individuals with a mean of 2.3. Hatching was estimated to occur mid-late June. Harlequins were found on streams ranging 5 m to over 30 m wide. Stream flows ranged from 24 cfs to >4000 cfs. Stream gradients were between 1.8 % and 2.8 %. Harlequins were found in assortment of habitats. Common to all the occupied streams was the presence of beaver activity, stream braiding or multiple channels, moderate to dense stream side vegetation, and a flyway above the stream mostly clear of overhanging vegetation. A decrease in duck numbers and brood size was observed compared to 1989. It is unclear if the decrease reflects a downward population trend, a normal fluctuation in the population, or is a function of survey methods.

INTRODUCTION

The harlequin duck (Histrionicus histrionicus) is a unique coastal seabird that migrates inland to streams and rivers to breed and raise its young. The distribution, biology, and habitat requirements of these rare ducks in Montana are not well comprehended and until recently have not been closely examined. Because of this lack of understanding and because of threats to its probable habitat, the United States Forest Service (USFS) in Region One lists the harlequin duck as a Sensitive Species (Reel, Schassberger and Ruediger 1988).

An understanding of the distribution and habitat needs of local populations of harlequin ducks is important for effective and proactive management of this sensitive species. To gain more information about harlequin ducks in northwestern and west-central Montana, the Kootenai National Forest contracted with the Montana Natural Heritage Program through the Challenge Cost-Share Program to conduct harlequin surveys during the seasons of 1988, 1989, and 1990.

Objectives of the ongoing harlequin duck project are to collect information to better define the distribution and population numbers of harlequin ducks in Montana; to identify and describe occupied nesting, brood rearing and migratory habitats; and to eventually develop a habitat suitability model. Our major goal of the 1990 field season was to continue harlequin surveys on streams in northwest and west-central Montana. Additionally,

our goals included identifying and describing nesting, brood rearing, and migratory habitat; and to collect stream habitat data.

This report presents the findings of the 1990 field season and a brief overview of the natural history and habitat requirements of the harlequin duck as understood to date.

OVERVIEW

Description

The harlequin duck is a small yet powerful diving duck. The males are exquisitely colored with slate grays, rusts, and brilliant white streaks and spots. Females are subtlety colored with a slate grayish-brown body and slightly lighter breast area. Both male and females have prominent white head patches. Coloration of juveniles (young of the year) resembles the female.

As the down disappears from the young and ducklings increase in size, it becomes difficult to distinguish juveniles from the adult female. The white head patches appear more mottled on the juveniles than on the adult females. Observations of behavior among the family group and reactions to disturbances can be helpful to distinguish adults from young. We observed the adult females to have a more alert behavior, looking around frequently, while the juveniles appeared to be concerned only of their immediate environment, unaware of the surroundings beyond. Adults usually reacted to our presence where juveniles often seemed unaware or aloof.

The adult harlequin male is quite distinct and can not readily be confused with other species. An adult male wood duck (Aix sponsa) has similar colors but different markings and body shape, most notably a crescent shaped head. The female harlequin, on the other hand, can be confused with other female ducks primarily the bufflehead (Bucephala albeola). Distinguishing features to note between the two are that the female harlequin has 3 white patches on each side of her head while the bufflehead only has one. In flight, a harlequin shows no white on the wing, where as the female bufflehead has prominent white patches on the secondaries.

Distribution

Two separate populations of harlequin ducks exist: a Pacific coast population and a smaller Atlantic coast population. The Atlantic breeding population occurs primarily in Labrador, Iceland and Greenland. The Pacific population extends from central California to northern Alaska and inland to the east front of the Rockies and south into northwest Wyoming (Bellrose 1980).

In Montana, breeding harlequins are known to occur on the Kootenai River, lower Clark Fork, and Flathead River drainages; streams in Glacier and Yellowstone National Parks; and streams on the east front of the Rocky Mountains (Kuchel 1977, Kerr 1989, Miller 1988 and 1989, MTNHP unpublished survey reports). Large concentrations of breeding harlequins occur on McDonald Creek in

Glacier National Park (Kuchel 1977) and along the east front of the Rocky Mountains on the Rocky Mountain Ranger District of the Lewis and Clark National Forest (S. Diamond pers. comm. 1990). As additional distributional surveys occur, a more complete understanding of the range will be established.

Migration

Like many migratory species, harlequins seasonally inhabit distinctly different areas. During the nonbreeding season, anywhere from July to April, the ducks congregate in secluded waters off the coast. It is during this time that pair bonding most likely occurs (Kuchel 1977, Bengston 1972, Wallen 1987).

During the spring harlequins migrate inland to breed and raise their young. Nonbreeding and unmated ducks also migrate inland to breeding grounds. Migration modes are speculative at this time, with proposed theories ranging from pure flight inland to swimming of the river systems similar to androgomous fish (Bengston 1966, Kuchel 1977). The number of hydropower dams and the frequency of sightings of harlequins on ponds, lakes and other water systems suggests that migration is oriented more to flight than swimming.

Harlequins generally arrive at nesting streams during April and May (Wallen and Groves 1989, Wallen 1987, Kuchel 1977, Miller 1988 and 1989). Mated males stay for 4 - 6 weeks, generally leaving to return to coastal grounds just prior to the initiation of incubation (Wallen 1987, Kuchel 1977). Bachelor males appear

to leave slightly earlier than the paired drakes. Unpaired females remain at nesting grounds for 3 - 5 weeks before returning to the coastal waters. Hens with broods remain for approximately 4 months, departing with or slightly before their broods (Kuchel 1977, Wallen 1987, Wallen and Groves 1989, Miller 1988 and 1989).

Breeding Biology

Harlequin females begin breeding when 2 years old (Bellrose 1980). Brood size varies from 1-9 individuals with the most successful broods occurring in areas with low human disturbance (Kuchel 1977, Wallen 1987, Wallen and Groves 1989, S. Diamond pers.comm. 1990). Harlequins exhibit a strong nest site tenacity, often returning to their same nesting area yearly (Bengston 1966, Wallen 1987, Kuchel 1977, Dzinbal 1982, Wallen and Groves 1989). Additionally, the offspring exhibit natal fidelity, often returning to the areas where they were hatched and raised (Kuchel 1977, Wallen 1987).

Wallen and Groves (1989) estimated incubation of eggs in Idaho to begin mid-May and hatching to occur 30 days after. Miller (1989) observed similar findings in western Montana. Incubation and hatching dates of broods in Grand Teton National Park were observed to occur 1 month later than that of the Idaho population; with nesting times initiating in mid-June and hatching in mid-July (Wallen 1987, Wallen and Groves 1989). It appears that both the nesting and hatching times and the arrival

and departure dates vary with local populations. This variation may be attributed to timing of spring runoff, differences in elevations, timing of phenology of stream side vegetation, or for other reasons unknown to us at this time (Kuchel 1977, Wallen 1987).

Harlequin ducklings are capable of flight at approximately 6 weeks old. Shortly thereafter, they begin to depart for Pacific coast waters (Kuchel 1977, Wallen 1987, Wallen and Groves 1988).

Habitat Use

Harlequin ducks, unlike most other ducks, inhabit swift flowing, often treacherous mountain streams. Harlequins studied in the Rocky Mountain region feed primarily on aquatic benthic insects such as caddisflies and stoneflies (Wallen 1987, Kuchel 1977). In Iceland and Alaska, salmon roe comprise a significant portion of the duck's food base (Bengston 1966, Dzinbal 1982). Based on the studies completed to date in the Rocky Mountain region (Wallen 1987, Kuchel 1977, Wallen and Groves 1988, 1989) harlequin summer habitat is described as containing:

1. a stream with high water quality and a healthy population of aquatic insects.
2. a low gradient perennial stream with areas of swift water.
3. stream side cover, usually comprised of moderate to dense shrubs.

4. presence of cover and loafing areas such as logjams, debris piles, mid-stream rocks, gravel bars.

5. presence of brood rearing areas such as beaver ponds, stream braids, meanders, side channels.

As we study more populations of harlequins our understanding of winter and summer habitat may change or become more refined.

SURVEY AREA

Our survey area included streams and rivers in northwest and west-central portions of Montana (Figure 1), lands primarily within the Kootenai National Forest (KNF). Additionally, we also sampled 8 streams on the Lolo National Forest (LNF) (Figure 2). For logistical purposes, we roughly divided the survey area into northern and southern portions with each of us focusing on a portion. Land ownership is primarily United States Forest Service (USFS) with scattered areas of State, private, and private industry lands.

METHODS

We selected streams to survey that had records of harlequin duck sightings, possessed the likelihood of containing attributes of harlequin habitat, or were recommended to us by Forest Service personnel or local naturalists.

We conducted two types of surveys: a spring occurrence

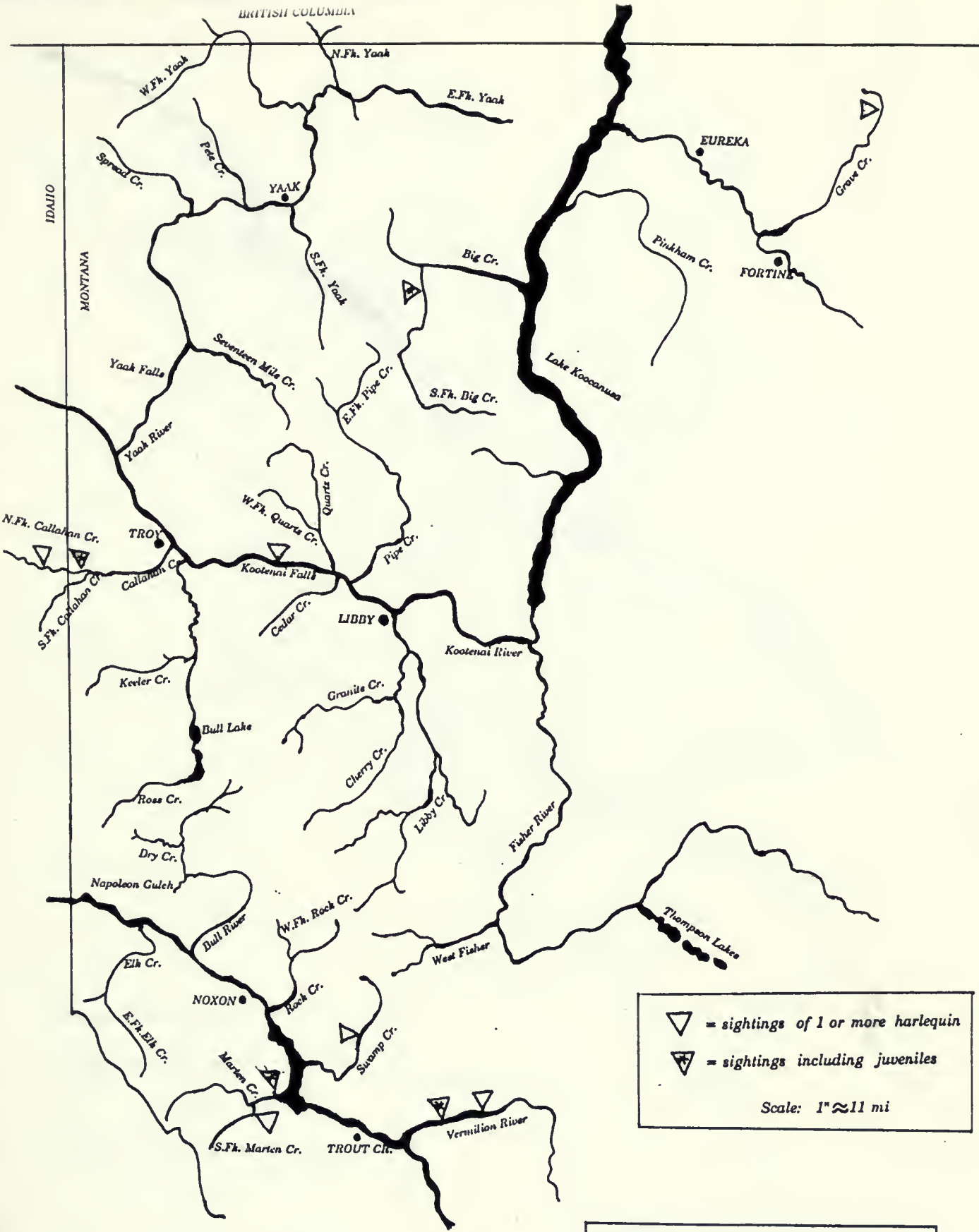

Figure 1. STREAMS SURVEYED FOR HARLEQUIN DUCKS ON THE KOOTENAI NATIONAL FOREST.

Figure 2. STREAMS SURVEYED FOR HARLEQUIN DUCKS ON THE LOLO NATIONAL FOREST.

survey and a summer brooding survey. Our objectives of spring surveys were to:

1. locate harlequin ducks.
2. determine staging areas.
3. estimate arrival times.
4. identify streams to include in summer brood surveys.

We conducted spring surveys by walking or driving along streams or bodies of water searching for harlequin ducks and subjectively assessing the habitat. We were not able to walk in the streams due to the unsafe conditions created by spring runoff.

We conducted our summer brood surveys in a similar fashion to spring surveys, additionally taking advantage of opportunities to walk or canoe streams. We preferred to walk upstream when possible as this proved to be more effective at locating and observing harlequin ducks. Our objectives of summer brood surveys were to:

1. determine occurrence and distribution of harlequin ducks and broods.
2. describe occupied and unoccupied habitat.

For both surveys we completed a Natural Heritage Animal Survey Form (Appendix A).

To characterize and describe stream and harlequin duck habitat we assessed particular components of the area surveyed:

1. type of stream channel.
2. stream side vegetation.
3. presence and type of loafing areas, hiding cover, and

brood rearing habitat.

4. availability of food base.
5. disturbance risk or potential threats to area.
6. stream gradient.
7. stream temperature.
8. stream width and flow volume.

Our methods for describing the 8 components follow:

stream channel - Using USFS definitions (D. Perkinson pers. comm. 1990) we classified portions of streams we surveyed as braided, meandered, channeled, or canyoned.

stream side vegetation - We determined stream side vegetation by periodically recording type and density or cover of prominent vegetation or substrate as we walked the stream. We determined density of general vegetation types and substrate types by stopping approximately every 10 minutes and ocularly estimating percent cover of types along approximately 50 ft stretch of stream. We grouped coverages into 3 classes: Low (1-30%), Moderate (31-70%) and High (71-100%). We defined vegetation types as the most prominent species or group of species observed. For example, some types of vegetation groups we encountered were: "riparian shrub composed of willow (salix spp), alder (alnus spp), and black twin-berry (Lonicera involucrata)" and "willow (salix spp) flats interspersed with gravel bars". We also determined coverages of prominent non-vegetated areas such as gravel bars, bed rock, and mud flats.

loafing areas, hiding cover, brood rearing habitat - We reviewed literature to determine the kinds of harlequin duck loafing areas, hiding cover and brood rearing habitat encountered (Cassirer 1989, Dzinbal 1982, Kerr 1989, Kuchel 1977, Miller 1989, Wallen 1987, Wallen and Groves 1988, 1989). We considered loafing areas to primarily include gravel bars, instream rocks, and logs. We determined hiding cover to be overhanging shrubs, debris piles, rocks larger than harlequin ducks or any other objects that would reasonable provide hiding cover. We considered areas that provided dense cover and slow water to be brood rearing areas, such as side channels and beaver pond areas. We subjectively rated occurrence of these components as Low (rare), Medium (common or present) or High (frequent).

food base - We evaluated food base primarily on occurrence of stone and caddisflies. If we easily observed the insects we considered food source to be common. If we experienced difficulty in finding the insects we determined food source to be low.

disturbance or potential threat - We recorded person caused disturbances that we felt does or could disturb or threaten quality of habitat. We noted activities such as high use recreation spots along rivers, proposed timber cutting units along riparian areas or stream sides, and heavy cattle grazing.

stream gradient - Using topographical maps (2.64 in/mi scale) we calculated stream gradient by determining percent elevation gain to distance traveled.

stream temperature - We took stream temperature in a representative portion of the stream, usually where we measured stream flow.

stream width and flow - We measured stream width (actual water width not channel width) and flow in representative portions of the streams. Adapting a Robbins and Crawford (1954) method, we determined an approximate stream flow in cubic feet per second (cfs). We first measured a cross section of the stream and divided it into three equal segments. At the midpoint of each segment we measured water depth, and surface velocity; determined by the amount of time a fishing bobber travels 5 ft. Using the following formula we calculated stream flow in cfs:

R= WDaV

where R = stream flow volume of segment

W = width of segment in ft

D = depth in ft taken at mid point of segment

a = bottom factor constant of .8

V = surface velocity of segment.

Total stream flow was then determined by summing the values of R.

Additionally, we collected historic sighting information and gathered other local sightings of harlequin ducks. As the opportunity arose we made informational contacts with recreationists, outfitters, and local establishments and continued to distribute sighting posters (Appendix B).

RESULTS and DISCUSSION

Summary of Findings

We surveyed a total of 45 streams, 37 on the Kootenai National Forest and 8 on the Lolo National Forest, between May 5, 1990 and August 31, 1990 (Table 1). During these surveys we observed harlequin ducks on 39 occasions; conservatively estimating a minimum of 27 individuals. Of the 27 individuals, 6 were males, 7 females and 14 juveniles (Table 2). We located the harlequins on 7 different streams on the Kootenai National Forest: Big Creek, Callahan Creek, Grave Creek, Kootenai River, Marten Creek, Swamp Creek and the Vermilion River. We located harlequin ducks on 1 stream on the Lolo National Forest: Trout Creek (Table 2).

We discovered a minimum of 5 broods on 4 streams; one each on Big Creek, Callahan Creek, Marten Creek, and two on the Vermilion River. The sightings on Callahan Creek and Big Creek are the first confirmed sightings of breeding harlequins on those streams. We observed brood size to range between 1 and 3 individuals with a mean of 2.3. By backdating plumage development of broods (Gollup and Marshall 1954) we estimated incubation to occur from mid-May to mid-June. We estimated hatching dates to occur approximately one month later, mid-late June.

Migration dates were difficult to estimate as we could not follow individuals to gather such information. We used confirmed

Table 1. Results of Streams Surveyed on the Kootenai and portions of the Lolo National Forests.

FOREST-DISTRICT	STREAM	DATE	STARTING POINT	MILES UPSTREAM SURVEYED	HARLEQUIN SIGHTINGS	SIGHTING LOCATION
Kootenai N.F.						
Fortine R.D.	Grave	6-17,18-90	T36N,R25W,Sec27	12	2 females	T36N,R25W,Sec1,NE1/4
		8-02-90	T36N,R24W,Sec12	4	0	N/A
		8-20-90	T36N,R24W,Sec1	3.5	0	N/A
Rexford R.D.	Big (incl S. Fk Big)	6-13-90	T34N,R29W,Sec3	18	0	N/A
		8-21-90	T35N,R29W,Sec33	16	1 juvenile	T34N,R30W,Sec4,SE1/4
	Pinkham	6-12-90	T35N,R28W,Sec4	6	0	N/A
Libby R.D.	Cedar	6-16-90	T31N,R32W,Sec25	3	0	N/A
	Cherry	8-11-90	T29N,R31W,Sec14	4	0	N/A
		8-15-90	T30N,R30W,Sec35	1	0	N/A
	Granite	6-24-90	T29N,R31W,Sec4	1.5	0	N/A
		8-14-90	T29N,R31W,Sec2	5	0	N/A
	Kootenai	5-08-90	T30N,R31W,Sec3	9	0	N/A
		5-17-90	T31N,R32W,Sec17	32	(see Koot. Falls)	N/A
		8-12-90	T31N,R32W,Sec16	3	0	N/A
		8-17-90	T30N,R31W,Sec3	9	0	N/A
	Libby	8-13-90	T28N,R31W,Sec25	3.5	0	N/A
	Pipe	7-05-90	T31N,R31W,Sec20	13	0	N/A
	E.FK. Pipe	6-13-90	T33N,R31W,Sec16	7	0	N/A
	Quartz	5-08-90	T31N,R32W,Sec24	1.5	0	N/A
			T32N,R31W,Sec35	1	0	N/A
		6-14,15-90	T31N,R32W,Sec12	10	0	N/A
	W.FK Quartz	6-23-90	T31N,R32W,Sec2	4	0	N/A
	West Fisher	7-03-90	T27N,R28W,Sec29	11	0	N/A
		8-15-90	T27N,R30W,Sec30	6	0	N/A
Three Rivers R.D.	Callahan	5-08-90	numerous pts	N/A	0	N/A
		7-24-90	T31N,R35W,Sec24	8	0	N/A

FOREST-DISTRICT	STREAM	DATE	STARTING POINT	MILES UPSTREAM SURVEYED	HARLEQUIN SIGHTINGS	SIGHTING LOCATION
	N. Fk of Callahan	5-23-90 7-23-90 8-04-90	T59N,R3E,Sec21 T31N,R35W,Sec24 T31N,R35W,Sec24	6 8 1	2 males, 1 female 1 female, 3 juv. 2 juveniles	T59N,R3E,Sec20,NE1/4 T31N,R35W,Sec23,E1/2 T31N,R35W,Sec24,E1/2
	S.Fk of Callahan	7-23-90	T31N,R35W,Sec24	7	0	N/A
	Keeler	6-21,22-90 7-30,31-90	T30N,R33W,Sec17 T30N,R33W,Sec17	7 10	0 0	N/A N/A
	Kootenai	8-03-90	T31N,R33W,Sec12	16	0	N/A
	Kootenai Falls	5-08-90 5-17-90 5-20-90 6-30-90 7-21-90 8-19-90	T31N,R33W,Sec13 T31N,R33W,Sec13 T31N,R33W,Sec13 T31N,R33W,Sec13 T31N,R33W,Sec13 T31N,R33W,Sec13	1 1 .5 .5 1 1	0 1 male 2 males 0 0 0	N/A T31N,R33W,Sec13,N1/2 T31N,R33W,Sec13,N1/2 N/A N/A N/A
	Pete	7-1,2-90	T35N,R32W,Sec5	5.5	0	N/A
	Ross	6-20-90 7-31-90	T28N,R33W,Sec7 T28N,R33W,Sec8	1 2.5	0 0	N/A N/A
	Seventeen Mile	5-21-90 7-13-90	T34N,R33W,Sec27 T34N,R33W,Sec27	3 3	0 0	N/A N/A
	Spread	5-21-90 7-11-90	T35N,R33W,Sec10 T36N,R33W,Sec33	2 3	0 0	N/A N/A
	Yaak	5-22-90 7-01-90 7-04-90 8-7,8,10-90	T35N,R32W,Sec2 T35N,R33W,Sec9 numerous sites T33N,R33W,Sec11	10 4.5 3 11	0 0 0 0	N/A N/A N/A N/A
	E. Fk Yaak	7-16,17,90	T37N,R31W,Sec22	8	0	N/A
	N. Fk Yaak	5-20-90 7-16-90	T37N,R31W,Sec22 T37N,R31W,Sec22	3 5	0 0	N/A N/A
	S. Fk Yaak	8-09-90	T35N,R32W,Sec1	4	0	N/A
	W. Fk Yaak	5-20-90 7-14-90 7-20-90 7-22-90	T37N,R31W,Sec32 T37N,R31W,Sec32 T37N,R32W,Sec6 T37N,R32W,Sec35	3 5 6 5	0 0 0 0	N/A N/A N/A N/A

FOREST-DISTRICT	STREAM	DATE	STARTING POINT	MILES UPSTREAM SURVEYED	HARLEQUIN SIGHTINGS	SIGHTING LOCATION
Fisher River R.D.	Fisher	7-9,11-90 8-20,22-90	T30N,R29W,Sec16 T30N,R29W,Sec16	12 29	0 0	N/A N/A
Cabinet R.D.	Bull River	8-01-90	T26N,R33W,Sec3	3.5	0	N/A
	Dry	6-20-90	T28N,R33W,Sec32	1	0	N/A
	E. Fk Elk	6-13-90 7-17-90	T26N,R34W,Sec16 T26N,R34W,Sec16	2.5 3	0 0	N/A N/A
	Marten	5-05-90 5-19-90 6-12,13-90 7-16,17-90 8-10-90	T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32	1 1 4 5.5 4	1 male 1 male 1 male, 1 female 0 0 1 female, 3 juv.	T25N,R32W,Sec32,SW1/4 T25N,R32W,Sec32,SW1/4 T25N,R32W,Sec32,SE1/4 N/A N/A T25N,R32W,Sec32,SW1/4
	S. Fk of Marten	5-05-90 5-09-90 5-19-90 6-12-90 7-16-90	T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32 T25N,R32W,Sec32	.5 3 .5 1 2	0 1 female, 1 male 0 0 0	N/A T24N,R33W,Sec1,NE1/2 N/A N/A N/A
	Napoleon	6-20-90	T27N,R33W,Sec9	.5	0	N/A
	Rock	5-24-90 6-14-90 7-19,20-90	T26N,R32W,Sec22 T26N,R32W,Sec27 T26N,R32W,Sec27	4 4 8.5	0 0 0	N/A N/A N/A
	W. Fk Rock	5-24-90 7-20-90	T26N,R32W,Sec10 T26N,R32W,Sec10	2 1	0 0	N/A N/A
	Swamp	5-05-90 5-19-90 6-25-90 8-09-90	T25N,R31W,Sec20 T25N,R31W,Sec20 T25N,R31W,Sec20 T25N,R31W,Sec20	.5 .5 4 7	0 0 2 females 0	N/A N/A T25N,R31W,Sec4,NE1/4 N/A
	Vermilion	5-05-90 5-19-90 7-12-90 8-15,17-90	T24N,R31W,Sec12 T24N,R31W,Sec12 T24N,R31W,Sec12 T24N,R31W,Sec14	1 2.5 3 14	0 1 female, 1 male 0 1 female, 3 juv. 1 female, 1 juv or 2 juveniles 1 female, 3 juv.	N/A T24N,R31W,Sec12,SE1/4 N/A T24N,R30W,Sec2,NE1/4 T24N,R30W,Sec1,NE1/4 T25N,R29W.Sec32,SW1/4

FOREST-DISTRICT	STREAM	DATE	STARTING POINT	MILES UPSTREAM SURVEYED	HARLEQUIN SIGHTINGS	SIGHTING LOCATION
Lolo N.F.						
Missoula R.D.	Rock	8-31-90	T11N,R17W,Sec12	10.5	0	N/A
Plains-Thompson Falls R.D	Fishtrap	6-28,29,90 8-6,7-90	T23N,R27W,Sec33 T23N,R27W,Sec33	9 12	0 0	N/A N/A
	Graves	6-26-90 7-26-90	T22N,R30W,Sec11 T22N,R30W,Sec11	3 3.5	0 0	N/A N/A
	Prospect	8-14-90	T21N,R29W,Sec7	3	0	N/A
	Thompson R.	8-02-90	T24N,R27W,Sec23	6.5	0	N/A
Superior R.D.	Big	7-02-90 8-29-90	T19N,R30W,Sec27 T19N,R20W,Sec27	4.5 4.5	0 0	N/A N/A
	St. Regis	7-03-90 8-28-90	T18N,R29W,Sec24 T18N,R29W,Sec24	10 10	0 0	N/A N/A
	Trout	7-5,6-90 8-29,30,90	T16N,R26W,Sec23 T16N,R26W,Sec13	7.5 12	1 female 0	T15N,R26W,Sec18,SW1/4 N/A

Table 2. Harlequin Duck Sightings from the 1990 Surveys.

FOREST - DISTRICT	STREAM	DATE	HARLEQUIN SIGHTINGS Males (M)	Females (F)	Juveniles (J)	& Age Class*
Kootenai N.F.						
Fortine R.D.	Grave Cr.	6-17-90	0 M	2 F	0 J	
Rexford R.D.	S. Fk. Big Cr.	8-21-90	0 M	0 F	1 J	III or fledged
Three Rivers R.D.	N. Fk. Callahan	5-23-90	2 M	1 F	0 J	
		7-23-90	0 M	1 F	3 J	II C
		8-04-90	0 M	0 F	2 J	III or fledged
	Kootenai Falls	5-17-90	1 M	0 F	0 J	
		5-20-90	2 M	0 F	0 J	
Cabinet R.D.	Marten Cr.	5-05-90	1 M	0 F	0 J	
		5-19-90	2 M	1 F	0 J	
		8-10-90	0 M	1 F	3 J	fledged
	S. Fk. Marten Cr.	5-09-90	1 M	1 F	0 J	
	Swamp Cr.	6-25-90	0 M	2 F	0 J	
	Vermilion River	5-19-90	1 M	1 F	0 J	
		8-16-90	0 M	2 or 3 F	7 J	III
Lolo N.F.						
Superior R.D.	Trout Cr.	7-05-90	0 M	1 F	0 J	
Total sightings =			10 M	13 F	16 J	
Min. # of individuals =			7 M	8 F	14 J	

* Estimated Age Classes adapted from Bellrose (1980)

sightings to speculative dates of migration. Ducks appear to migrate to their breeding grounds sometime in April. The last male we saw was on May 23 indicating to us that the male migration back to the coast probably occurred in mid to late May. Our last sighting of an adult female was on August 15 and of juveniles was August 21. We estimate migration times to begin mid to late August. The hens may depart earlier than the broods.

We found harlequins on streams ranging from 5 m (16 ft) to over 30 m (100 ft) wide and with flows of 24 cfs to >4000 cfs. Stream gradients were between 1.8 % and 2.8% (Table 3). We found the harlequins in an assortment of habitats, such as flat, graveled, willow-cottonwood flood plains; narrow bed rock canyons; and streams with adjacent mature forests. All the streams where we found broods had beaver activity, stream braiding or distinctive side channels. Stream side vegetation in these areas tended to be moderate to dense.

We gathered historical and recent sightings, trying to confirm sightings when possible (Table 4).

Discussion of Creeks Where We Found Harlequin Ducks

Big Creek - Rexford District (KNF)

On August 21 we located a lone juvenile 9 miles up Big Creek, technically on the South Fork of Big Creek. The bird was initially sighted by Forest Service personnel assisting in the survey and then by us several hours later approximately 1 mile from the first observation. We are assuming we both saw the same

Table 3. Stream Data for Streams Surveyed in 1990.

FOREST-DISTRICT	STREAM	DATE	CFS	TEMPERATURE CELSIUS	% GRADIENT	STREAM WIDTH	# OF DIPPERS
Kootenai N.F.							
Fortine R.D.	Grave	6-17-90 8-20-90	est. >300 70	9 10	2.4 2.4	40 ft (12 m) 30 ft (9 m)	1
Rexford R.D.	Big/S.Fk. Big	8-21-90	29	19	2.0	33 ft (10 m)	4
Libby R.D.	Cherry	8-11-90	37	15	1.1	27 ft (8 m)	3
	Granite	8-14-90	73	--	2.1	23 ft (7 m)	3
	Kootenai R.	5-6,17-90 8-12-90 8-17-90	4000 8000 10600	-- -- --	0.1 0.1 0.1	100 ft (30 m) 100 ft (30 m) 100 ft (30 m)	0 0 0
	Libby	8-13-90	15	15	2.2	18 ft (5 m)	0
	Pipe	8-13-90	75	13	1.3	30 ft (12 m)	3
	Quartz	6-14-90	92	10	1.9	25 ft (8 m)	4
	W.Fk. Quartz	6-23-90	88	10	3.5	24 ft (7 m)	1
	West Fisher	7-03-90 8-15-90	190 16	10 12	0.8 0.8	27 ft (8 m)	1 1
Three Rivers R.D.	N.Fk. Callahan	7-23-90 8-4-90	50 38	13 15	2.8 2.8	36 ft (11 m) 29 ft (9 m)	16 2
	S.Fk. Callahan	7-23-90	27	14	3.5	27 ft (8 m)	0
	Keeler	6-21-90 7-30-90	245 54	9 10.5	1.8 1.8	36 ft (11 m) 28 ft (11 m)	0 5
	Kootenai Falls	5-8,17-90 6-30-90 7-21-90 8-19-90	4000 26200 9600 7100	-- -- -- 13	-- -- -- --	100 ft (30 m) 100 ft (30 m) 100 ft (30 m) 100 ft (30 m)	0 0 0 0
	Kootenai River	8-3-90	21400	--	0.1	120 ft (37 m)	0
	Pete	7-01-90	27	--	1.2	24 ft (7 m)	2

FOREST-DISTRICT	STREAM	DATE	CFS	TEMPERATURE CELSIUS	% GRADIENT	STREAM WIDTH	# OF DIPPERS
	Ross	6-20-90 7-31-90	125 47	6.5 8	3.1 3.1	24 ft (7 m) 22 ft (6 m)	2 8
	Seventeen Mile	7-13-90	109	21	1.7	35 ft (11 m)	2
	Spread	7-11-90	130	--	3.0	35 ft (11 m)	2
	Yaak						
	E.Fk. Yaak	7-16-90	160	16	1.5	25 ft (8 m)	6
	N.Fk. Yaak	7-16-90	76	12	0.4	53 ft (16 m)	4
	S.Fk. Yaak	8-09-90	65	12	2.1	25 ft (8 m)	3
	W.Fk. Yaak	7-20-90	71	15	3.3	37 ft (11 m)	4
Fisher River R.D.	Fisher River	7-09-90 8-20-90	365 124	15.5 16.5	0.5 0.5	71 ft (22 m) 70 ft (21 m)	2 7
Cabinet R.D.	Bull River	8-01-90	244	15.5	0.2	60 ft (18 m)	1
	Dry	6-20-90	48	8	3.0	17 ft (5 m)	0
	E. Fk Elk	6-13-90 7-17-90	84 29	9 10	0.8 0.8	21 ft (6 m) ---	3 3
	Marten	5-05-90 5-19-90 6-12-90 7-16-90 8-10-90	156 134 112 42 24	7.5 5.5 7.5 16 10	2.0 2.0 2.0 2.0 2.0	30 ft (9 m) --- 28 ft (8 m) --- ---	0 0 6 4 6
	S.Fk. Marten	5-05-90 5-19-90 6-12-90 7-16-90	66 56 72 20	7.5 5.5 6 11	2.0 2.0 2.0 2.0	16 ft (5 m) --- 18 ft (5 m) 16 ft (5 m)	0 0 0 0
	Napoleon Gulch	6-20-90	7	--	6.0	8 ft (2 m)	0
	Rock	6-14-90 7-19-90	152 82	5.5 9.5	1.9 1.9	27 ft (8 m) 25 ft (8 m)	2 16
	W.Fk. Rock	7-20-90	8	9	--	13 ft (4 m)	0

FOREST-DISTRICT	STREAM	DATE	CFS	TEMPERATURE CELSIUS	% GRADIENT	STREAM WIDTH	# OF DIPPERS
	Swamp	5-05-90 5-19-90 6-25-90 7-09-90	111 91 98 24	10 9 7.5 10.5	2.7 2.7 2.7 2.7	31 ft (9 m) 30 ft (9 m) 33 ft (10 m) 16 ft (5 m)	0 0 2 12
	Vermilion	5-05-90 5-19-90 7-12-90 8-15-90	293 237 194 118	9.5 9 12 9	1.8 1.8 1.8 1.8	45 ft (14 m) --- --- 42 ft (13 m)	? 0 6 36
Lolo N.F.							
Missoula R.D.	Rock	8-31-90	229	11	0.6	90 ft (27 m)	0
Plains R.D.	Fishtrap	6-28-90 8-06-90	124 46	8.5 9	1.2 1.2	21 ft (6 m) 21 ft (6 m)	10 15
	Graves	6-26-90 7-26-90	112 49	6.5 7.5	4.2 4.2	16 ft (5 m) 16 ft (5 m)	4 7
	Prospect	8-14-90	69	12.5	1.2	36 ft (11 m)	3
	Thompson River	8-02-90	79	12	0.6	30 ft (9 m)	0
Superior R.D.	Big	7-02-90 8-29-90	93 22	9 12.5	1.1 1.1	23 ft (7 m) 20 ft (6 m)	6 11
	St. Regis R.	7-03-90 8-28-90	464 128	12 11.5	0.6 0.6	80 ft (24 m) 51 ft (15 m)	2 5
	Trout	7-05-90 8-29-90	144 48	11 14	2.0 2.0	30 ft (9 m) 29 ft (9 m)	24 14

Table 4. Historical Sightings of Harlequin Ducks.

FOREST-DISTRICT	LOCATION	DATE	SIGHTING	OBSERVER
Kootenai N.F.				
Cabinet R.D.	East Fork Bull- near Lost Cab Gulch	1988-May	1 male, 1 female	Andy Juden-Heron, MT
	Bull River-near Star Gulch	1989-May	1 male	Jim Swanson-Thompson Falls, MT
	Galena Gulch	9-3-1989	3-4 juv or female	T.P. Michael
	Marten Creek - near Bay	5-21-88 6-18-88 6-29-89 8-11-89	4 males 1 female, 6 juveniles 1 juvenile 2 females, 12 juveniles	Gene Miller - MTNHP " " "
	Rock Creek	6-27-89	1 female	Gene Miller - MTNHP
	South Fork Marten	6-13-88 6-18-88 5-14-89 6-29-89	4 males, 2 females 3 males, 1 female 1 male, 1 female 1 female	Gene Miller - MTNHP " " "
	Swamp Creek	8-01-88 6-28-89 8-10-89	1 female 2 females, 10 juveniles 1 juvenile	Gene Miller - MTNHP " "
	Vermilion River	7-13-88 7-17-88 7-07-89 8-14-89	3 females 1 female, 3 juveniles 1 female, 7 juveniles 2 females, 11 juveniles	Gene Miller - MTNHP " " "
Fortine R.D.	Grave Creek	1980's 5-19-89 6-01-89 7-19-89	occurrance-specifics unknown 1 male, 1 female 2 males, 2 females 1 female	Steve Fox, Tim Manley-USFS, MTFWP Rick Kerr - MTNHP " "
Libby R.D.	Quartz Creek-1/2 to 1 mile upstream from mouth	1981 or 1982	1 male, 1 female	Al Bratkovich-USFS
	Quartz Creek-1/2 mile upstream from mouth	1987 or 1988	3 chicks caught unharmed in upstream fishtrap. Released unharmed.	Barry Hansen-MTFWP

FOREST-DISTRICT	LOCATION	DATE	SIGHTING	OBSERVER
	Yaak River	1980's-Christmas Bird Count, year unknown 1979,1980 - hunting season	3 female 1 female shot each year	Barry Hansen-MTFWP Jon Jeresek-USFS anon. - embarrassed local hunter
Rexford R.D.	Big Creek confl. with Lake Koocanusa	1988-spring	1 adult	Marge Swanson-Libby, MT
	Alkali Lake	1990-late May	1 male	Jay DeShazer-USFS
	69 Ranch	1990-spring	1 male (?)	Butch & Donna Cate-land owner, Eureka
Three Rivers R.D.	Callahan	1986-spring	1 male, 1 female	Barry Hansen-MTFWP
	East Fork Yaak	1980's-date unknown	occurrance-specifics unknown (may be wood ducks)	Clint and Gloria Mills-Yaak, MT
	Kootenai Falls	1980's-yearly 1980's-yearly	numerous sightings of males, females, and some juv. Nest site located within log/debris jam above Falls.	numerous biologists and bird watchers Carl Wolf-USFS
	N. Fk. Yaak-near Caribou C.G.	1980's-date unknown	occurrance-specifics unknown	Bill Pomeroy-USFS
	Seventeen Mile -1 mile upstream from mouth -1/4 mile upstream from mouth near bridge	5-10-85 1988	1 male, 1 female occurrance-specifics unknown	Kay & Joe Burk Bill Pomeroy-USFS
	Spar Lake- at Whoopee Creek confluence	1988-spring	1 male, 1 female	Bob Byars-USFS
	Yaak River-at mile post #13 -near mile post #13 -mile post #23 -at Yaak Merc. -confl. of N.Fk.Yaak	1983-spring 1989,1990-springs 1989-spring 1988 or 1989-spring 1989-spring	occurrence-specifics unknown 1 male, 1 female 1 male 1 male, 1 female 1 male, 1 female (?)	Randy Matchet-MTFWP Jim Calvi-land owner Jim Kibler-USFS Dick McGary-land owner Crash Krause-land owner

individual.

The harlequin was amazingly difficult to see even at close range as it blended perfectly with the color and size of the prevalent stream rocks. The bird, fully feathered, looked similar to an adult female except it's white facial patches were less distinguishable and the body size appeared slightly smaller. The duck's inattentive behavior and lack of concern for our presence further suggested to us that it was a juvenile. We did not observe the bird attempting to fly and therefore were unsure if it was capable of flight. The lone sighting of a fully feathered juvenile in late August suggested to us that migration was imminent and the hen and perhaps other brood members had already departed.

The main stem of Big Creek is characterized by numerous instream rocks, boulders and a forested stream side. Beaver ponds, stream braids and side channels, more abundant further up the South Fork and it's east and west branches, provide numerous nesting and brood rearing opportunities. Additionally, the roadless nature of the east and west branches provide the seclusion desirable for productive populations.

Even though historic sightings of harlequins on Big Creek are limited; one adult observed at mouth in spring of 1988, Big Creek has always been considered harlequin duck habitat. We believe harlequins were probably present but not observed at the time due to the difficulty of seeing them.

Grave Creek - Fortine District (KNF)

On June 17 we observed 2 adult females together approximately 15 miles up Grave Creek, near the same location of the 1989 sightings. After careful observation we concluded that the females were not maintaining a nest site and did not have broods in the vicinity. Additional surveys conducted by us and by the USFS throughout the summer did not result in any more sightings.

Streamside cover, beaver activity, and side channels are common, providing nesting and brood rearing habitat. Mature sub-alpine fir/spruce stands with shrub understories border the stream where we observed the ducks.

Our observation of 2 adult females during usual incubation or hatching time suggests to us the ducks were either non-breeders (1 year olds or mateless), or breeding females that suffered nest loss. An especially rainey spring and a late spring (June 12) snow storm resulting in > 4" snow accumulation may be factors contributing to possible nest failure. Other considerations, such as recreation use or stream degradation, need further investigation to determine their possible impact on breeding harlequins in Grave Creek.

While adult harlequins have been sighted on several occasions, no records exist for observations of juveniles on Grave Creek. Further investigations are necessary to determine if nesting is occurring and if so, if repeated nest loss is happening.

North Fork of Callahan Creek - Three Rivers District (KNP)

On May 23 we observed three harlequins, one pair and one lone male, approximately 5 miles up the North Fork of Callahan Creek. Stream side shrubbery had burst bud but not yet leafed out and scattered patches of old snow could be found under areas of thick canopied trees. Callahan Creek appeared to be near peak runoff. Exposed gravel bars, debris piles, side channels with calm waters and signs of beaver activity were all in close proximity of the ducks. Unnoticed, we observed the ducks feeding, loafing on gravel bars and rocks, riding the rapids, and interacting. The paired male defended a territory around the female as the lone male attempted advances.

On July 23 we observed a female and 3 juveniles approximately 3 miles downstream from our spring observation. Assuming the female to the individual we saw during May, we speculate that nesting occurred in the vicinity of the spring sighting. Ten days later, August 4, we located 2 juveniles 1 mile further downstream. We are assuming these two ducks to be part of the brood seen before, though it is possible these are additional ducks of the same brood or are from a different brood altogether. Our sighting of the two lone juveniles on August 4 may indicate that the female probably had begun her migration back to the Pacific coast.

The North Fork of Callahan Creek is characterized by numerous small, bed rock canyons, exposed gravel bars, and high energy runoffs. Stream side vegetation is primarily forested

with a moderate shrub component. The main stem of Callahan Creek is similar with features more pronounced. Large canyons, greater than 50 ' high, with willow-gravel flats characterize this main stem, resulting in a local name of "The Callahan Canyons".

Scattered unconfirmed sightings of harlequins on Callahan Creek have been reported throughout the years. Our sightings verify speculations that the Callahan stream system hosts a breeding population of harlequin ducks.

Kootenai Falls - Three Rivers District (KNF)

Kootenai Falls continues to be a gathering or a staging area for harlequin ducks during spring migration. During the 1990 survey we sighted 1 male on May 17 loafing on a rock below the main falls and 2 males on May 20 loafing above the falls on the rock terraces. We did not observe any other harlequins during later surveys.

The number of harlequins sighted in 1990 at Kootenai Falls is lower than in 1989. During the 1989 surveys 10 sightings of harlequins were made, with a minimum of 6 individuals (4 males and 2 females) identified (Kerr 1989). In 1990 we sighted only 3 harlequins, all male, and a minimum of 2 individuals. We do not know if this decrease in sightings is reflective of a decrease in returning population, a normal fluctuation in the population, a change in migration patterns, or is a function of survey success.

The water level of the Kootenai River is controlled by Libby Dam, located 16 miles north of Libby. The water level, usually

fluctuating significantly on a daily or weekly basis, remained high for most of the late spring and summer. Areas where we observed loafing harlequins in 1989 and May of 1990 remained under water for most of the season. It is unclear whether the dynamics of the Kootenai's water level influences the use of the river by harlequin ducks.

Major road construction and reconstruction occurring along adjacent Highway 2 resulted in periodic large blasts throughout the spring and summer. The road construction, while possibly affecting the ducks due to increased noise levels, significantly reduced the human visitation of Kootenai Falls. The inability to access the area also reduced the number of desired survey opportunities.

Marten Creek - Cabinet District (KNF)

Our first observation of a harlequin on Marten Creek was on May 5 when we observed a single male fly up the creek from Marten Bay. Stream side shrubs were about half leafed out and water flows were increasing. On May 19 we located a single male and a pair within 1 mile of each other. We did not observe any other harlequins on the main stem of Marten Creek until August 10 when we counted 1 female with 3 juveniles.

Marten Creek has numerous braids with a high amount of beaver activity. Shrub cover, primarily consisting of willow and alder species, is generally moderate to high. Brooding habitat appears common.

South Fork of Marten Creek - Cabinet District (KNF)

We observed a pair of harlequins approximately 1.5 miles up the South Fork of Marten Creek on May 9. The week prior USFS personnel observed a pair and a lone male in the same vicinity. Despite not locating any young during the brood surveys, we suspect harlequins are nesting on the South Fork of Marten Creek. The ducks may be located further upstream than we surveyed or we could have overlooked ducks during the surveys. Additional surveys to confirm nesting is recommended and investigations to determine if nest loss is occurring and potential causes of losses is needed.

The lower South Fork of Marten is a braiding stream through a willow-cottonwood-conifer bottom. Shrub density is medium and beaver activity is apparent. Potential nesting and brood rearing habitat is available. Gravel bars and debris piles are common.

Vermilion River - Cabinet District (KNF)

The Vermilion River continues to have the greatest known density of harlequins within our survey area. It is a diverse river characterized by a medium amount of braiding and shrub cover and high amounts of beaver activity. Gravel beds, riffles, and small gorges are present.

Our first observation occurred on May 19, when we located a pair of harlequins. On August 16, we observed 2 separate broods each with 3 young and a group of 2 other ducks consisting of 1 juvenile and either a female or another juvenile. We located the

broods above the gorge between Grouse Creek and Vermilion Falls, approximately 3-5 miles further upstream than where we saw the broods last year.

We noted an obvious decrease in brood size and total duck numbers from 1988 and 1989. It is unclear if the decrease reflects a downward population trend, a normal fluctuation within the population, or is a function of survey methods.

Swamp Creek - Cabinet District (KNF)

On June 25 we watched 2 female harlequins loafing on a large mid-stream boulder. As we approached they slipped into the water and slowly swam downstream. We did not observe any behavior to indicate that nests or broods were in the vicinity. We speculate that the ducks were either non-breeding females or hens that experienced nest loss. If nest failure did occur, a possible factor could be the extremely high and powerful fall and spring runoffs which caused some rechannelization, washouts and movement of large gravel beds.

Swamp Creek, averaging 30 ft wide (9 m), is highly braided with some steep boulder falls. Stream side vegetation, composed of willow, alder, and dogwood, is dense with moderate overstory cottonwood cover. Loafing areas, debris jams and beaver ponds are all present.

Trout Creek - Superior District (LNF)

On July 5, we located 1 female on Trout Creek; the only

sighting all season. Her behavior indicated to us that she was not maintaining a nest or brood. In 1989 we observed broods on Trout Creek but could not locate any in 1990. We suspect the female we observed is either a non-breeding female or a hen that experienced nest loss.

Trout Creek is similar to other lower Clark Fork tributaries in that it is a highly braided stream with medium shrub and timber cover. We noted areas of medium beaver activity, gravel bars, undercut banks, and stream side meadows. Trout Creek is a very diverse stream with numerous types of streamside habitats.

Discussion of Potential Harlequin Duck Streams

Several streams we surveyed stand out as potential harlequin duck streams, due to quality habitat or combination of key components. Our lack of observations on these streams does not indicate that ducks are not there, rather, only that we did not observe any. Survey time was limited and additional surveys are highly recommended. A summary by ranger district of those streams we feel that have quality harlequin habitat follows. Potential harlequin duck streams are highlighted.

Kootenai National Forest

Three Rivers District - We feel there is a high probability that breeding harlequins occupy portions of the **Yaak River**. During recent years, landowners and recreationist have sighted harlequin ducks during spring and summer. Repeated sightings

occur approximately 1 mile below Yaak Falls in the canyons and above the Burnt Dutch Road bridge near mile post 13.

Seventeen Mile Creek, The South Fork and **The East Fork of the Yaak River** all appear to have quality habitat and have records of harlequin sightings. **The North Fork of the Yaak River** has good habitat. Unconfirmed reports of harlequin ducks congregating in swampy portions of the river approximately 1 mile north of the Canadian border needs to be investigated. The portion of the **West Fork of the Yaak River** which runs beside trail #318 also appears to have good habitat and is relatively secluded. Additionally, **Keeler Creek** appears to have good habitat.

Libby District - Harlequin ducks appear to use the **Kootenai River** as a traditional migratory route. We speculate that some tributaries of the Kootenai serve as nesting grounds. **Quartz Creek** is probably one of these streams. While we did not locate any harlequins on Quartz Creek during surveys in 1989 or 1990, previous sightings (Table 4) and the availability of habitat indicate to us that Quartz Creek is an important stream.

West Fisher Creek appears to have very good habitat and warrants additional surveys and evaluation. Our surveys of portions of **Cherry Creek, Libby Creek** and **lower Granite Creek** indicate that quality habitat exists but human disturbance is moderate to high in some areas. **Pipe Creek** also has portions with quality habitat and areas of high human caused disturbance.

Cabinet District - **Rock Creek** appears to have quality

habitat and some use by harlequins, as indicated by our 1989 observation of a lone female.

Lolo National Forest - Several streams on the Lolo Forest appear to have a likelihood of possessing harlequin ducks. Predominate streams are **Rock Creek** (Missoula District), **Fishtrap Creek** (Plains-Thompson Falls District) and the **St. Regis River** (Superior District).

Discussion of Results

Because harlequins can be difficult to see we feel that it is important to emphasize that a lack of observations during a survey does not necessarily indicate harlequins are not there but rather they were not observed.

We located harlequins in a number of different habitat components. Due to this high variability we encountered, we were not able to delineate specific parameters for harlequin habitat. In general, we can describe harlequin habitat as containing a clean flowing stream with gravel bars, beaver activity, shrub and/or rock cover and a lack of overhanging canopy cover over most of the main flow of the stream. We found harlequins on streams ranging from 5 m (16 ft) to over 30 m (100 ft) wide. Stream flows ranged form 24 cfs to >4000 cfs. The sections of streams where we found ducks had gradients between 1.8% and 2.8%. Streams were generally cool ranging in temperature of 5.5° C to 19° C.

We feel that the American dipper (Cinclus mexicanus) can not

be used as an associated species to indicate harlequin habitat. We found dippers on 28 of the 37 streams surveyed. There was no consistent correlation between dipper observations and harlequin observations or habitat quality.

As we surveyed streams we examined bird droppings to try to determine harlequin droppings from other species. From our observations we feel that harlequin droppings contain rock chips, sand, and chitinous insect remains. These droppings appeared distinctive due to the rock chips, but perhaps could be mistaken for a common merganser's (Mergus merganser) or a hooded merganser's (Lophodytes cucullatus). Further observations are necessary to more completely describe harlequin droppings and to differentiate them from other ducks droppings.

We observed noticeably fewer ducks and smaller brood sizes than in 1989. It is unclear if this reflects a downward population trend, a normal fluctuation in the population, or is a function of survey methods.

We suspect that nest failures may have occurred on Grave Creek on Fortine District, Swamp Creek on Cabinet District and Trout Creek on Superior District. Above average rainfalls during spring or fall flooding that altered habitat may be a contributing factors. Additionally, a severe snow storm in June may have impacted the Grave Creek site.

Climatic conditions during 1990 differed from the recent droughty years in that a higher than normal spring rain fall occurred. Spring runoff occurred at what is considered a normal

time but was still 2-4 weeks later than the past 2 years. In 1989, a November rain-on-snow event occurred in the Cabinet Mountains leading to severe flooding in some streams. Downed trees, washouts, and new channel cutting were apparent in many of the Cabinet streams we surveyed. This event significantly altered portions of stream side habitat and left other portions unscathed. It is unknown if the November flooding impacted nest site habitat.

RECOMMENDATIONS FOR FUTURE SURVEYS

Continued monitoring and surveying of streams with known harlequin duck populations is essential for determining population and habitat condition trends. In areas where nest failures may have occurred, (i.e. Grave Creek, Swamp Creek and Trout Creek), a close evaluation of stream and streamside management, recreation use, and climatic patterns would be beneficial to help determine possible causes and potential solutions for the failures. Streams with known populations are: Fortine District - Grave Creek; Rexford District - Big Creek; Three Rivers District - North Fork of Callahan Creek, Kootenai Falls; Cabinet District - Marten Creek, South Fork of Marten Creek, Swamp Creek, Vermilion River.

Additionally, we recommend that surveys continue on those streams that possess quality habitat and historic use. High priority streams on the Kootenai Forest include:

Three Rivers District - Yaak River, North Fork of the Yaak,

South Fork of the Yaak, East Fork of the Yaak, West Fork of the Yaak, Seventeen Mile Creek, Keeler Creek, Lake Creek, and Stanley Creek.

Libby District - Quartz Creek, West Fisher Creek, Libby Creek, Lower Granite Creek, Cherry Creek, and Pipe Creek.

Fisher River District - Fisher River.

Cabinet District - East Fork of Elk Creek, Rock Creek.

Priority streams on the Lolo Forest include:

Missoula District - Rock Creek.

Plains/Thompson Falls District - Fishtrap Creek.

Superior District - St. Regis River, Trout Creek.

We feel the most productive survey time is when the young are actively feeding on the stream, usually during the daytimes from mid-July through August. Early spring surveys, during April and May, are the next most productive survey times and can help locate potential nesting areas and migrating routes. We feel the least effective time to survey is June, when nesting and high runoff is occurring.

CLOSING REMARKS

The harlequin duck is one of many unique lifeforms found in Montana. These surveys suggest the harlequin is a rare species in northwest and west-central Montana. To better protect and to enhance management of the harlequin duck in western Montana, a

closer examination of site specific habitat use is needed. Surveys to monitor population trends and habitat condition also is needed. As we learn more about the harlequin duck in Montana, our lack of knowledge once when it leaves the state becomes more apparent. Research is needed to examine harlequins' migratory methods and routes, and to determine the use and condition of coastal habitats. Migratory species pose a special challenge for managers. A cooperative effort between the Pacific Northwest states and British Columbia would be beneficial in developing an integrated mangement plan for the harlequin duck.

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MONTANA NATURAL HERITAGE PROGRAM
ANIMAL SURVEY FORM

Location* _____ Date _____

Quad Name/Code _____ TRS* _____

Species/Element* _____

Area/Distance surveyed* _____ Time spent* _____

Weather _____

Temp _____ Water flow _____ Water temp _____

Cover type _____

Habitat description* _____

Observations (numbers, sex, age, etc.)* _____

_____

_____

Behavioral notes _____

_____

General notes for next site visit _____

_____

Photo: Y___ N___ Specimen: Y___ N___

Associated animal species _____

_____

Estimated total acres of potential habitat in area: _____ _____

Landowner _____

Threats to EO _____

_____

Site condition _____

_____

_____

Observer(s)* _____

Address* _____

(* = required field)

ATTENTION WILDLIFE WATCHERS

WE NEED SIGHTINGS OF

HARLEQUIN DUCKS

WE NEED YOUR HELP

The Montana Natural Heritage Program is surveying Montana's mountain streams for harlequin ducks - one of the state's rarest and most beautiful wildlife species.

We would like your help in locating these mountain ducks. Please report your sightings as soon as possible to the nearest Forest Service office or to:

David Genter
MT Natural Heritage Program
1515 East 6th Ave.
Helena, MT 59620
(406) 444-3009.

WHERE TO LOOK

Harlequins nest on mountain streams, usually 15 feet or greater in width. They prefer streams with good water quality, dense shrubs along the stream edge, and away from human disturbance.

WHAT TO LOOK FOR

Harlequins are small ducks (16" in length). The photo below shows an adult paired male and female. Males are bluish-gray with rusty sides and various-shaped white patches on the head. Females are light brown with a distinct white spot behind the eye. Look for breeding pairs during May and June, and females with young during July and August. Young birds look like the female.

The Nature Conservancy